# PATENT ABSTRACTS OF JAPAN

(54) IMAGE INPUT DEVICE

(57)Abstract:

PURPOSE: To input an accurate image with a high SN ratio by storing an A/D converted digital electric signal and computing a mean value of plural times of reading. CONSTITUTION: A storage part 42 alternately executes storage and reading by the capacity of one line. At the time of storing, a digital signal inputted from an A/D conversion part 41 is stored, and at the time of reading, the stored image is outputted to a computing part 43. At the reading time of the storing part 42, the computing part 43 computes a mean value between the digital signal outputted from the A/D conversion part 41 and a signal read out from the storage part 42 in each picture element and an output part 5 outputs a picture signal outputted from the computing part 43 to the outside of the device or a storage device. A driving part 6 moves an illuminating part 8, an image forming part 2 and a photoelectric conversion part 3 in a sub-scanning direction vertical to the array direction of a photoelectric conversion element 31 relatively to an original and a control part 11 controls the state, sequence, etc., of the whole device.
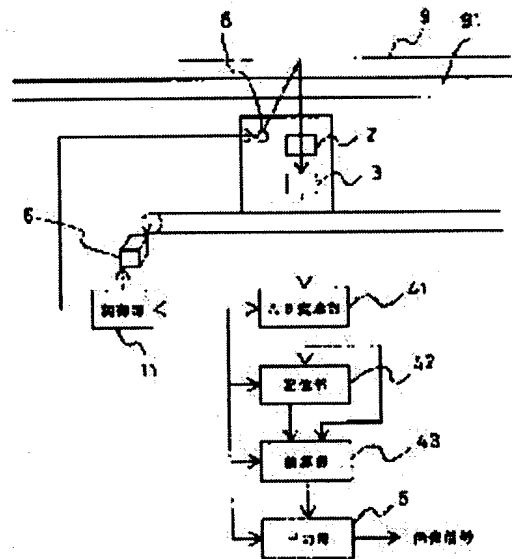
LEGAL STATUS

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[Date of final disposal for application]

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CLAIMS

[Claim(s)]
[Claim 1] A lighting means to irradiate a manuscript, and the image formation means, to which image formation of the reflected light from said manuscript is carried out, In the picture input device which inputs the image which has the photo-electric-translation means which carries out photo electric translation of the light in which said image formation means carried out image formation by two or more optoelectric transducers arranged in the main scanning direction An AD translation means to input the electrical signal of the analog which said photo-electric-translation means outputs, and to change into a digital signal, A storage means to memorize the digital signal which said AD translation means outputs, and an operation means to calculate the average for every pixel of a main scanning direction from the output of said AD translation means, and the output of said storage means, The picture input device characterized by having an output means to output outside the signal which said operation means outputs, and the driving means which moves said lighting means and said condensing means in said main scanning direction and direction of a right angle to said manuscript and the control means which controls the sequence of the whole equipment.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] This invention relates to the picture input device which changes into a picture signal manuscripts, such as an image input scanner used for the computer image processing system which processes an image.
[0002]
[Description of the Prior Art] In the conventional picture input device, as shown in drawing 2 , light is irradiated from the lighting section 8 at a manuscript 9. It changes into an electrical signal by two or more optoelectric transducers 31 which carried out image formation of the light from a manuscript 9 in the image formation section 2, and have been arranged by the photoelectrical converter 3 using CCD etc. in the main scanning direction at the single tier. The lighting section 8, the image formation section 2, and the photoelectrical converter 3 are moved in the direction of the array of an optoelectric transducer 31, and the direction of a right angle in an actuator 6, and a picture signal is outputted to the equipment exterior or a recording device, taking the activation point of an actuator 6, and a synchronization in the output section 5.
[0003] Here, in the conventional picture input device, the light which the photoelectrical converter 3 inputs is a photon, and presumes the reflection factor of a manuscript from the number of the photons by which incidence is carried out to fixed time amount. Therefore, the statistical error called a shot noise is included in the output of the photoelectrical converter 3. Moreover, in addition to this, various electric noises are contained in the electrical signal of the analog which the AD translation section outputs.
[0004]
[Problem(s) to be Solved by the Invention] By the conventional approach, since there were an above-mentioned shot noise and an above-mentioned electric noise, there was a problem of degrading the S/N ratio of the image inputted from a picture input device. Then, the object of this invention is obtaining the picture input device which inputs the exact high image of a S/N ratio by memorizing the digital electrical signal by which the AD translation was carried out, and calculating the average of the read of multiple times, in order to solve such a conventional technical problem.
[0005]
[Means for Solving the Problem] The support means which supports a manuscript in this invention in order to solve the conventional technical problem, A lighting means to irradiate a manuscript, and an image formation means to carry out image formation of the light from a manuscript to a photoelectrical converter, A photo-electric-translation means to change into the electrical signal of an analog the light which carried out image formation by two or more optoelectric transducers arranged on the image formation side of said image formation means at the main scanning direction, An AD translation means to input the electrical signal of the analog which said photo-electric-translation means outputs, and to output a digital signal, A storage means to memorize the digital signal which said AD translation means outputs, and an operation means to calculate the signal which the digital signal which said AD translation means outputs, and said storage means memorized, An output means to output the picture

signal which said operation means outputs to the equipment exterior or storage, The driving means to which the relative displacement of said lighting means, said image formation means, and said photo-electric-translation means is made to carry out in the direction vertical to the direction of arrangement of an optoelectric transducer to said manuscript, and the control means which manages a condition, a sequence, etc. of the whole equipment constituted the picture input device.

[0006]
[Function] In the picture input device constituted as mentioned above, the light from a lighting means changes into the electrical signal of an analog the light which the manuscript irradiated, was made to carry out image formation of the light from said manuscript on a photo-electric-translation means with an image formation means, and carried out image formation with said photo-electric-translation means by the optoelectric transducer arranged in the main scanning direction corresponding to each pixel, and changes the electrical signal of the analog from said photo-electric-translation means into a digital signal with an AD translation means. Storage and read-out are performed with a storage means. The image which memorized the digital signal from said AD translation means at the time of storage, and was memorized at the time of read-out is outputted to an operation means. with an operation means, the average of the output of the digital signal which carries out reading appearance and which said AD translation sometimes outputs and said storage means of said storage means is calculated, and the picture signal which said operation means outputs with an output means is outputted to the equipment exterior or storage. Making the relative displacement of the driving means carry out in the direction of vertical scanning vertical to the direction of arrangement of said lighting means, said image formation means, and said photo-electric-translation means of said optoelectric transducer to said manuscript, a control means manages a condition, a sequence, etc. of the whole equipment.

[0007] Thus, the picture input device which inputs an image with a high SN ratio is realizable by averaging the digital picture signal of two or more lines which carried out the AD translation.

[0008]
[Example] Below, the suitable example of this invention is explained based on a drawing. In drawing 1 , a supporter 91 supports a manuscript 9 by the well-known approach, and the lighting section 8 irradiates light to it by the well-known approach at a manuscript 9. The light in which the image formation section 2 made carry out image formation of the reflected light from a manuscript 9 to the photoelectrical converter 3, and image formation was carried out by the image formation section 2 by the photoelectrical converter 3 is changed into the electrical signal of an analog by two or more optoelectric transducers 31 arranged in the main scanning direction corresponding to each pixel as shown in drawing 3 . The AD translation of the electrical signal of the analog which said photoelectrical converter 3 outputs in the AD translation section 41 is carried out to a digital signal. The storage section 42 is the capacity for one line, and performs storage and read-out by turns. The image which memorized the digital signal from said AD translation section 41 at the time of storage, and was memorized at the time of read-out is outputted to operation part 43. In operation part 43, the average of the digital signal which said AD translation 41 outputs at the time of read-out of said storage section 42, and the read-out signal of said storage section 42 is calculated for every pixel, and the picture signal which said operation part 43 outputs in the output section 5 is outputted to the equipment exterior or storage. Here, an actuator 6 makes the relative displacement of said lighting section 8, said image formation section 2, and said photoelectrical converter 3 carry out in the direction of vertical scanning vertical to the direction of the array of said optoelectric transducer 31 to said manuscript, and a control section manages a condition, a sequence, etc. of the whole equipment.

[0009] Below, the photoelectrical converter 3 which is the central component of this invention, the AD translation section 41, the storage section 42, and operation part 43 are explained at a detail. However, the light which the photoelectrical converter 3 inputs is a photon, and presumes the reflection factor of a manuscript from the number of the photons by which incidence is carried out to fixed time amount. Therefore, the statistical error called a shot noise is included in the output of the photoelectrical converter 3. Moreover, in addition to this, various electric noises are contained in the electrical signal of the analog which the AD translation section outputs.

[0010] What is necessary is to lengthen the storage time of photo electric translation, for making an SN ratio high generally, or just to make area of an optoelectric transducer large. However, since the photoelectrical converter 3 detects the amount of light when a photon collides and electronic level changes to the electron in a semi-conductor, saturation level cannot pose a problem and it cannot secure sufficient storage time. Moreover, when resolution is high, the area of an optoelectric transducer will usually become several micron extent around. Therefore, an SN ratio will be restricted to the ratio of noise level to the saturation level of an optoelectric transducer in the direction using usual. So, in this invention, when reading image data, even when resolution is high, the image of a high SN ratio which does not receive a limit of saturation level can be inputted by averaging 2 times of the conversion values of an optoelectric transducer. If 2 times of conversion values are added simply, since signal level is in phase, it doubles since close comes, and close comes at random and noise level will become twice [square root] 2, an SN ratio becomes twice [square root] 2.

[0011] In order to improve an SN ratio further, it enables it to calculate the average of two lines which approaches also about an image input in this invention, although the method of improve an SN ratio by calculate the average of two or more lines about white criteria or black criteria from the former in the shading compensation in the AD translation section for amend the variation in an output at the time of the sensibility of each optoelectric transducer or dark is learn. For this reason, the resolution of the direction of vertical scanning to the AD translation section is twice the resolution of the image after the equalization by operation part 43.

[0012] Although the example in the case of above averaging read data of two lines was shown, when the capacity of the storage section 42 is two or more lines, the average of two or more lines can be calculated. When an averaging operator is carried out by n lines, an SN ratio is improved the square root twice of n. Moreover, you may make it calculate the read data of two or more lines once memorized in the storage section by operation part 43 by making storage capacity of the storage section 42 large to extent required for an averaging operator, without connecting the output of the AD translation section 41 to the direct operation part 43, as shown in <u>drawing 4</u> .

[0013] Furthermore, when it has the capacity for two or more screens, the storage section 42 may use what kind of thing, if it is the capacity whose averaging operator is possible. Moreover, although the example of the picture input device which the lighting section 8, the image formation section 2, and the photoelectrical converter 3 are above united, and moves in the direction of vertical scanning to a manuscript was shown, if it is picture input devices which input an image by the photoelectrical converter, such as a picture input device of a mirror migration mold or a manuscript migration mold, what kind of thing may be used.

[0014] Furthermore, although this example showed the example of the 1-dimensional picture input device of a mono-color, the same is said also of the picture input device and the two-dimensional picture input device of a color.

[0015]
[Effect of the Invention] As shown above, a support means, a lighting means, an image formation means, a photo-electric-translation means, an AD translation means, a storage means, the operation means, the output means, the driving means, and the control means constituted the picture input device from the picture input device by this invention.

[0016] By the picture input device by this invention, it is effective in the ability to input an image with a high SN ratio with this configuration as compared with the conventional picture input device.

[Translation done.]

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the block diagram showing the configuration of the picture input device by this invention.
[Drawing 2] It is the block diagram showing the configuration of the conventional picture input device.
[Drawing 3] It is the block diagram showing the configuration of the photoelectrical converter of this invention.
[Drawing 4] It is ****** which shows the configuration of the picture input device by other examples of this invention.
[Description of Notations]
2 Image Formation Section
3 Photoelectrical Converter
5 Output Section
6 Actuator
8 Lighting Section
9 Manuscript
11 Control Section
31 Optoelectric Transducer
41 AD Translation Section
42 Storage Section
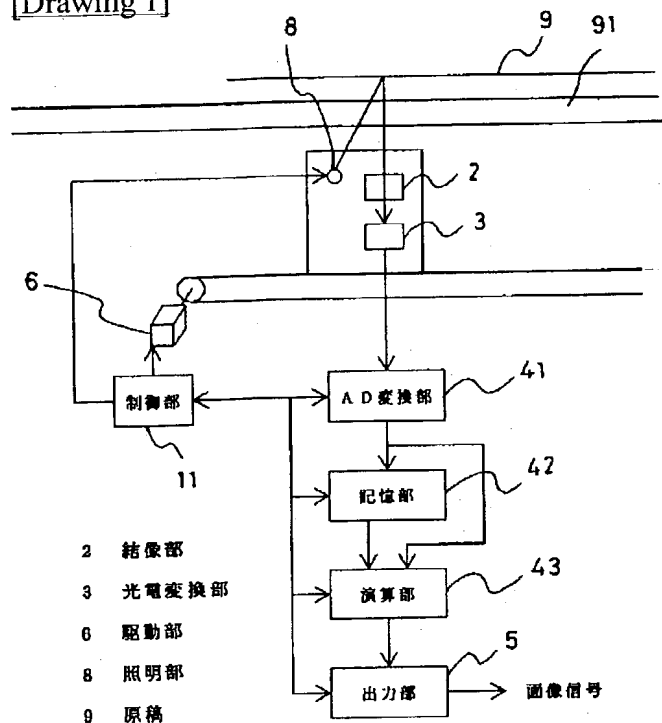43 Operation Part
91 Supporter

[Translation done.]

DRAWINGS

[Drawing 1]

2	結像部
3	光電変換部
6	駆動部
8	照明部
9	原稿

[Drawing 2]

[Drawing 3]

光電変換素子 31   3

□ □ □ □ □ □·□ □ □ □))(□ □ □

[Drawing 4]

8   9   91

2

3

6

制御部 ← → AD変換部   41

11

記憶部   42

演算部   43

5

出力部 → 画像信号
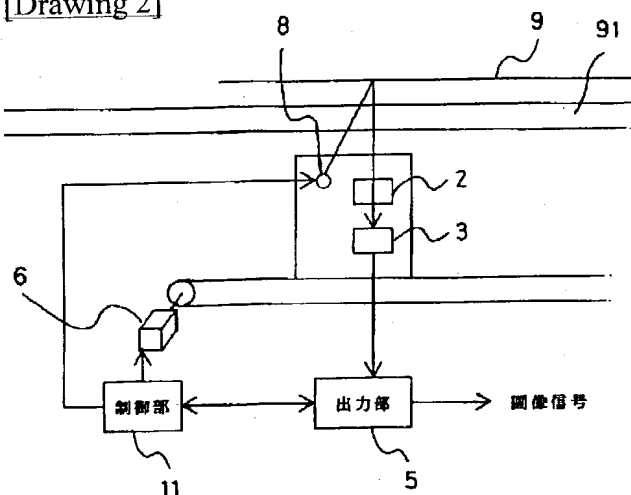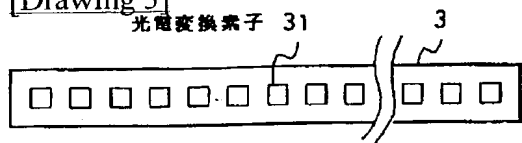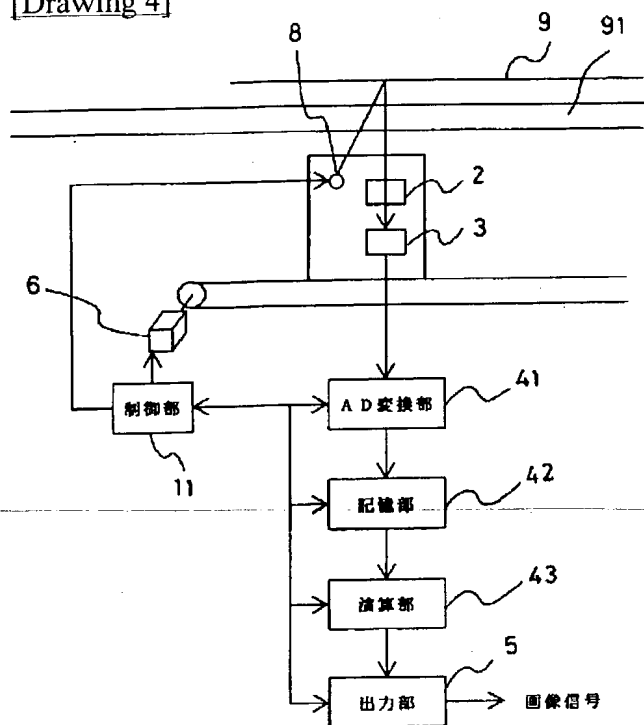
[Translation done.]

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G06T 1/00				
H04N 1/028	A			
1/19				

	G06F 15/64	400 E
	H04N 1/04	103 E

審査請求　未請求　請求項の数1　OL　（全 4 頁）

(54)【発明の名称】　画像入力装置

(57)【要約】

【構成】　光電変換部3の出力するアナログ信号を、Ａ
Ｄ変換部41でデジタル信号に変換し、前記ＡＤ変換部41
の出力を記憶部42で記憶し、演算部43で複数ラインの画
像データをn回平均して、ＳＮ比の√n倍よい画像を出
力部5から画像入力装置の外部に出力する。

【効果】　ＳＮ比の高い画像を入力する装置を実現す
る。

2　結像部
3　光電変換部
6　駆動部
8　照明部
9　原稿

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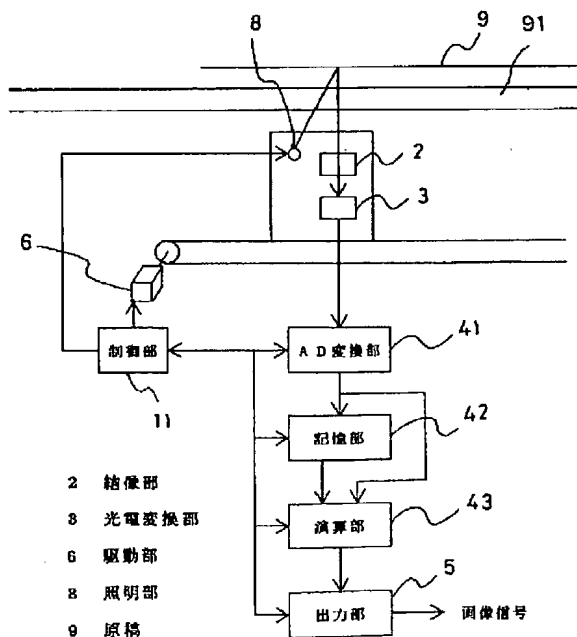
【特許請求の範囲】

【請求項1】　原稿を照射する照明手段と、前記原稿からの反射光を結像させる結像手段と、前記結像手段の結像した光を主走査方向に配置された複数の光電変換素子で光電変換する光電変換手段とを有する画像を入力する画像入力装置において、前記光電変換手段が出力するアナログの電気信号を入力しデジタル信号に変換するAD変換手段と、前記AD変換手段の出力するデジタル信号を記憶する記憶手段と、前記AD変換手段の出力と前記記憶手段の出力とから主走査方向の各画素ごとに平均値を演算する演算手段と、前記演算手段の出力する信号を外部に出力する出力手段と、前記照明手段及び前記集光手段を前記原稿に対して前記主走査方向と直角の方向に移動させる駆動手段と装置全体のシーケンスを制御する制御手段とを有することを特徴とする画像入力装置。

【発明の詳細な説明】

【0001】

【産業上の利用分野】本発明は、画像を処理するコンピューター画像処理システムに用いられる画像入力スキャナなど、原稿を画像信号に変換する画像入力装置に関する。

【0002】

【従来の技術】従来の画像入力装置では、図2に示すように照明部8から原稿9に光を照射し、原稿9からの光を結像部2で結像し、CCD等を用いた光電変換部3で主走査方向に一列に配置された複数の光電変換素子31により電気信号に変換し、駆動部6で照明部8及び結像部2及び光電変換部3を光電変換素子31の配列の方向と直角の方向に移動させ、出力部5で駆動部6の駆動位置と同期をとりながら装置外部もしくは記録装置に画像信号を出力する。

【0003】ここで、従来の画像入力装置では光電変換部3の入力する光は光量子であり、一定時間に入射される光子の数から原稿の反射率を推定している。したがって、光電変換部3の出力には、ショット・ノイズと呼ばれる統計的な誤差が含まれている。また、この他にも、AD変換部の出力するアナログの電気信号には様々な電気ノイズが含まれている。

【0004】

【発明が解決しようとする課題】従来の方法では、前述のショット・ノイズや電気ノイズがあるために、画像入力装置から入力される画像のS／N比を劣化させるという問題があった。そこで、この発明の目的は、従来のこのような課題を解決するために、AD変換されたデジタルの電気信号を記憶し、複数回の読取りの平均値を演算することによりS／N比の高い正確な画像を入力する画像入力装置を得ることである。

【0005】

【課題を解決するための手段】従来の課題を解決するために、本発明では、原稿を支持する支持手段と、原稿を

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照射する照明手段と、原稿からの光を光電変換部に結像させる結像手段と、前記結像手段の結像面上に主走査方向に配置された複数の光電変換素子により結像した光をアナログの電気信号に変換する光電変換手段と、前記光電変換手段の出力するアナログの電気信号を入力しデジタル信号を出力するAD変換手段と、前記AD変換手段の出力するデジタル信号を記憶する記憶手段と、前記AD変換手段の出力するデジタル信号と前記記憶手段の記憶した信号を演算する演算手段と、前記演算手段の出力する画像信号を装置外部もしくは記憶装置に出力する出力手段と、前記照明手段と前記結像手段と前記光電変換手段とを光電変換素子の配置の方向と垂直の方向に前記原稿に対して相対移動させる駆動手段と、装置全体の状態やシーケンス等を管理する制御手段とにより画像入力装置を構成した。

【0006】

【作用】上記のように構成された画像入力装置では、照明手段からの光が原稿に照射され、前記原稿からの光を結像手段で光電変換手段上に結像させ、前記光電変換手段で結像した光を各画素に対応して主走査方向に配置された光電変換素子によりアナログの電気信号に変換し、AD変換手段で前記光電変換手段からのアナログの電気信号をデジタル信号に変換する。記憶手段では記憶と読み出しを行う。記憶時には前記AD変換手段からのデジタル信号を記憶し、読み出し時には記憶した画像を演算手段に出力する。演算手段では、前記記憶手段の読み出し時に前記AD変換の出力するデジタル信号と前記記憶手段の出力の平均値を演算し、出力手段で前記演算手段の出力する画像信号を装置外部もしくは記憶装置に出力する。駆動手段は、前記照明手段及び前記結像手段及び前記光電変換手段を前記光電変換素子の配置の方向と垂直の副走査方向に前記原稿に対して相対移動させ、制御手段は装置全体の状態やシーケンス等を管理する。

【0007】このように、AD変換したデジタルの複数ラインの画像信号を平均することにより、SN比の高い画像を入力する画像入力装置を実現することができる。

【0008】

【実施例】以下に、この発明の好適な実施例を、図面に基づいて説明する。図1において、支持部91は公知の方法で原稿9を支持し、照明部8は公知の方法で原稿9に光を照射し、結像部2は原稿9からの反射光を光電変換部3に結像させ、光電変換部3で結像部2により結像された光を図3に示すように各画素に対応して主走査方向に配置された複数の光電変換素子31によりアナログの電気信号に変換し、AD変換部41で前記光電変換部3の出力するアナログの電気信号をデジタル信号にAD変換する。記憶部42は、1ライン分の容量で、記憶と読み出しを交互に行う。記憶時には前記AD変換部41からのデジタル信号を記憶し、読み出し時には記憶した画像を演算部43に出力する。演算部43では、前記記

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憶部４２の読み出し時に、前記ＡＤ変換４１の出力する
デジタル信号と前記記憶部４２の読み出し信号との平均
値を各画素ごとに演算し、出力部５で前記演算部４３の
出力する画像信号を装置外部もしくは記憶装置に出力す
る。ここで、駆動部６は前記照明部８及び前記結像部２
及び前記光電変換部３を前記光電変換素子３１の配列の
方向と垂直の副走査方向に前記原稿に対して相対移動さ
せ、制御部は装置全体の状態やシーケンス等を管理す
る。

【０００９】以下に、本発明の中心的な構成要素である
光電変換部３、ＡＤ変換部４１、記憶部４２、演算部４
３について、詳細に説明する。しかし、光電変換部３の
入力する光は光量子であり、一定時間に入射される光子
の数から原稿の反射率を推定している。したがって、光
電変換部３の出力には、ショット・ノイズと呼ばれる統
計的な誤差が含まれている。また、この他にも、ＡＤ変
換部の出力するアナログの電気信号には様々な電気ノイ
ズが含まれている。

【００１０】一般に、ＳＮ比を高くするには光電変換の
蓄積時間を長くしたり、光電変換素子の面積を広くすれ
ばよい。しかし、光電変換部３は半導体中の電子に光子
が衝突して電子の準位が変化することにより光の量を検
出するため、飽和レベルが問題となり、充分な蓄積時間
を確保することができない。また、解像度が高い場合に
は、通常光電変換素子の面積が数ミクロン四方程度にな
ってしまう。したがって、通常の使い方ではＳＮ比は光
電変換素子の飽和レベルに対するノイズ・レベルの比に
制限されてしまう。そこで、本発明では、画像データを
読み取る場合に、光電変換素子の２回の変換値を平均す
ることにより、解像度の高い場合でも飽和レベルの制限
を受けない高いＳＮ比の画像を入力することができる。
２回の変換値を単純に加算すると、信号レベルは同相で
入ってくるので２倍になりノイズ・レベルはランダムに
入ってくるので２の平方根倍になるため、ＳＮ比は２の
平方根倍になる。

【００１１】従来から、各光電変換素子の感度や暗時出
力のバラツキを補正するためのＡＤ変換部でのシェーデ
ィング補正においては、白基準や黒基準について複数ラ
インの平均値を演算することによりＳＮ比を改善する方
法が知られているが、本発明では、更にＳＮ比を改善す
るために画像入力についても近接する２ラインの平均を
演算できるようにしたものである。このため、ＡＤ変換
部までの副走査方向の解像度は、演算部４３での平均化
の後の画像の解像度の２倍になっている。

【００１２】以上に、２ラインの読取りデータを平均す
る場合の例を示したが、記憶部４２の容量が複数ライン
分の場合は、複数ラインの平均値を演算することができ
る。ｎラインで平均演算した場合には、ＳＮ比はｎの平

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方根倍に改善される。また、図４に示すように、記憶部
４２の記憶容量を平均演算に必要な程度に大きくするこ
とにより、ＡＤ変換部４１の出力を直接演算部４３に接
続せずに、一旦記憶部で記憶された複数ラインの読取り
データを演算部４３で演算するようにしても良い。

【００１３】さらに、記憶部４２は複数画面分の容量を
もつ場合など、平均演算のできる容量ならどのようなも
のを用いてもよい。また、以上に照明部８、結像部２及
び光電変換部３が一体となって、原稿に対して副走査方
向に移動する画像入力装置の例を示したが、ミラー移動
型や原稿移動型の画像入力装置など、光電変換部により
画像を入力する画像入力装置ならどのようなものでも良
い。

【００１４】さらに、本実施例ではモノカラーの１次元
の画像入力装置の例を示したが、カラーの画像入力装置
や２次元の画像入力装置でも、同様である。

【００１５】

【発明の効果】以上に示したように、本発明による画像
入力装置では、支持手段、照明手段、結像手段、光電変
換手段、ＡＤ変換手段、記憶手段、演算手段、出力手
段、駆動手段、制御手段により画像入力装置を構成し
た。

【００１６】この構成により、本発明による画像入力装
置では、従来の画像入力装置と比較して、ＳＮ比の高い
画像を入力することができるという効果がある。

【図面の簡単な説明】
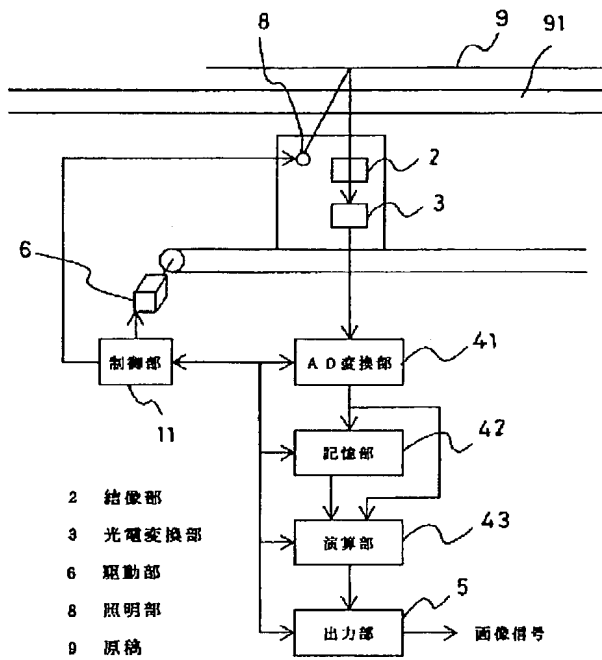
【図１】本発明による画像入力装置の構成を示す構成図
である。

【図２】従来の画像入力装置の構成を示す構成図であ
る。

【図３】本発明の光電変換部の構成を示す構成図であ
る。

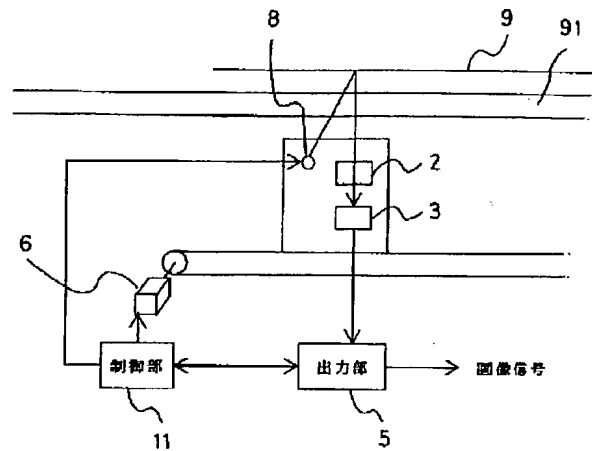【図４】本発明の他の実施例による画像入力装置の構成
を示す構成すである。

【符号の説明】

2　　結像部
3　　光電変換部
5　　出力部
6　　駆動部
8　　照明部
9　　原稿
11　　制御部
31　　光電変換素子
41　　ＡＤ変換部
42　　記憶部
43　　演算部
91　　支持部

【図1】

2　結像部
3　光電変換部
6　駆動部
8　照明部
9　原稿

制御部
AD変換部　41
記憶部　42
演算部　43
出力部　5　画像信号

【図2】

制御部
出力部　5　画像信号

【図3】

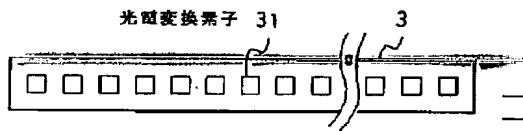光電変換素子　31　　3
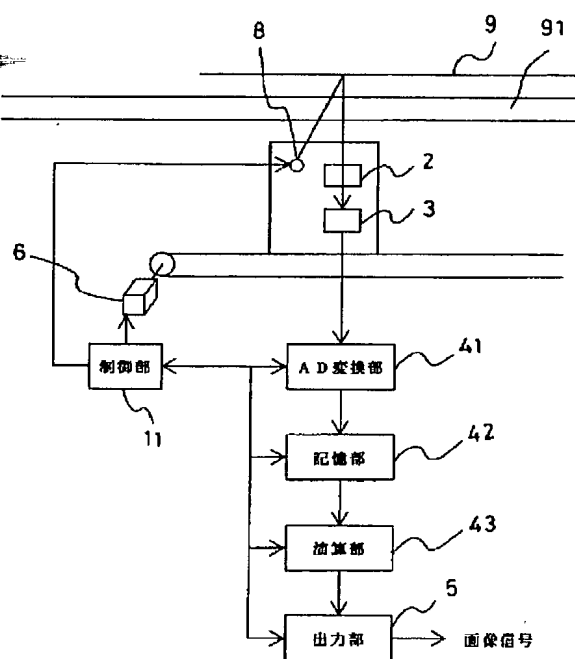

【図4】

制御部
AD変換部　41
記憶部　42
演算部　43
出力部　5　画像信号

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